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Electronic Business

FOR MANAGEMENT IN ELECTRONICS, COMPUTER & SYSTEMS COMPANIES — WORLDWIDE

FEBRUARY 20, 1989

CRAY UNDER FIRE

Survival strategies for supercomputer wars

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John Rollwagen, chairman and CEO of Cray Research

Electronic Business

FOR MANAGEMENT IN ELECTRONICS, COMPUTER AND SYSTEMS COMPANIES—WORLDWIDE

VOL. 17, NO. 4 FEBRUARY 20, 1989

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John Rollwagen photograph: Alvin Upitis

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Cray Research is at crossroads

A little less than two decades ago, Seymour Cray invented the supercomputer business. Since then, his company, Cray Research, has defined the market by defining the technology. But things change, and Cray is now threatened by the success of its own creation. Supercomputer sales have mushroomed into a $1 billion business, spawning many new rivals to challenge Cray's leadership.

Even though demand is expected to grow almost 25% a year to $2.46 billion in 1992, analysts agree that the market probably isn't large enough to accomodate the five U.S. and Japanese supercomputer firms (and two "mini" supercomputer makers) currently in it — not to mention the others that are poised to enter the fray. All are faced with pricing pressure, a distinct split between high-end and low-end business and a less sophisticated user base demanding standardized software.

As a result, Cray is at a critical juncture. Like many innovative high-flying companies before it, the supercomputer leader and industry watchers are wondering: Can a firm that virtually created an industry with its innovative technology stay on top once that industry matures? Chairman John Rollwagen is convinced that the answer is yes. Wall Street analysts aren't so sure. Our cover story explores this dilemma from several perspectives.

Ivory tower investments

Electronics firms have been in a giving spirit lately. Top companies donated more than $200 million in cash and equipment to U.S. universities last year. However, most got back more than they received. After Apollo Computer donated two computers to the University of Tulsa's petroleum department, the school spent $415,000 for Apollo equipment and is now eyeing 15 to 20 more workstations valued at as much as $300,000.

Barbara Berkman, associate editor

New ELECTRONIC BUSINESS associate editor Barbara Berkman takes us behind the gambling table of university donations. "Plunk down your equipment or cash and — ideally — walk away with more purchase orders, the best engineering recruits, the latest technology and a sense of corporate citizenry," writes Berkman. But it's a risky, high-stakes business and must be carefully managed like any other resource. Berkman, a seasoned business reporter, joins our staff after stints at *American Lawyer* newspaper and *Dunn's Business Review*.

BETH KARLIN, managing editor

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BPA ABP

University donations are a corporate challenge

The top electronics firms gave over $200 million in cash and equipment to U.S. universities last year. It was worth it, but . . .

James Brill needed a computer network two years ago; he just didn't want to pay for one. A professor of petroleum engineering at the University of Tulsa in Oklahoma, Brill contacted Apollo Computer Inc., Digital Equipment Corp., Hewlett-Packard Co. and Sun Microsystems Inc. and asked each for a donation of equipment to be used for advanced research. "Apollo was the only company to step forward," recalls Brill.

Lucky for Apollo. The two computers it donated worked so nicely that the university's petroleum department purchased six service processor nodes. The chemical engineering department dropped by to watch the system; it then purchased two workstations. Mechanical engineering bought one more. So far, the university has purchased $415,000 in Apollo equipment, and is now eyeing 15 to 20 more workstations valued at as much as $300,000.

For Apollo, a donation program has produced a wealth of benefits, as Brill explains. "We'll probably develop software and talk to our colleagues at other universities. We indirectly help [Apollo] market to the educational market."

Welcome to the gambling table of university donations: Plunk down your equipment or cash, and — ideally — walk away with more purchase orders, the best engineering recruits, the latest technology and a sense of corporate citizenry. But these potential benefits, if realized at all, come at a high price. Donation programs are expensive and must be managed like any other resource. But their goals, such as technology transfer, are tricky to administer and nearly impossible to monitor.

Universities in the United States received some $1.8 billion in corporate donations in 1987 and again in 1988, some $400 million of that in products assessed at fair market value, according to Hayden W. Smith, senior vice president of the Council for Aid to Education. Equipment donations last year declined after a steady upsurge since a 1982 tax law change, with some notable contribution cutbacks by IBM and others.

Why do electronics companies give? IBM, which shelled out a whopping $95 million in worldwide educational donations in 1987, maintains "there is no tie-in between donations and marketing of our product," claims Charles R. Bowen, director of IBM's university relations grant program. Big Blue donates "just out of a sense of corporate social responsibility," he says.

Smith for the Council of Aid to Education can't quite see it that way. "Nonsense. They're doing it for business reasons. There's no such thing as corporate philanthropy."

Those benefits are obvious. Equipment donations are regarded as a solid investment in both educating and making contact with potential recruits. "If students are learning on our tools, when they graduate, they are instantly productive," notes Jim Hill, corporate grants manager of Mentor Graphics Corp. Mentor also is betting that students weaned on its equipment now will purchase Mentor products on behalf of future employers later. And there are tax benefits: The cost and one-half the difference between the production cost and fair market value is deductible.

Contributions to education by top electronics companies

Contributions[1] ($ millions)	
AT&T	$40.0
Digital Equipment	50.0
GM Hughes Electronics	4.8[2]
General Electric	17.2
Hewlett-Packard	46.0
Honeywell	2.4
IBM	63.1
Motorola	1.9[3]
Xerox	50.0[4]

[1] Equipment noted at fair market value. 1987 latest figures available
[2] Excludes $287,400 in equipment at production value
[3] Semiconductor equipment only
[4] In cash and equipment since 1984

Source: ELECTRONIC BUSINESS

Laughingstock

But equipment donations are not trouble-free. Companies must commit to maintaining the equipment they install, or else their products and investment could fail. Explains Pierre Bouchard, grant program administrator for Apollo, which donated some $10 million in equipment last year: "If a donation isn't well managed from our side, instead of equipment being a shining spot at a school, it can become a laughingstock."

Technology transfer, a popular goal of donation programs, is particularly difficult to administer. Companies complain that one headache is the orchestration of a regular exchange between academics and executives, and suggest implementing monthly meetings. DEC, for one, makes sure technology gets back to the company. It designates an engineering group as sponsor of specific grants, and then demands a fee — a percentage of the grant awarded — to ensure the group has a direct interest in actively monitoring the research.

Even when technology is transferred, the pace is often sluggish. Donors are at the mercy of the academic calendar, notes Robert M. White, Control Data Corp.'s chief technical officer: "In industry, if we have a problem, we can throw resources at it and get an answer quickly."

But White adds that university technology may come as a bargain compared with in-house research. "In some sense it's a good deal. Here you have access to the world's experts . . . and we can not afford to have experts in all our areas."

The greatest challenge of donation programs is convincing top management of the program's validity. Corporate giving will always be an undocumentable allocation of resources, laments Apollo's Bouchard. "I have to show what returns I give the company from the program. The program's ink is black, but it's not as black as other departments."

BARBARA N. BERKMAN

Are there too many supercomputer makers?

The influx of Japanese and low-end manufacturers will likely lead to a shakeout. Cray prepares for a fight

Despite the "us" versus "them" attitude surrounding the supercomputer industry today, supercomputer makers on both sides of the Pacific are facing similiar problems that have more to do with business than with economic or technological might.

Market leader Cray Research Inc. and ETA Systems Inc., the Control Data Corp. supercomputer subsidiary, have much in common with the Japanese supercomputer troika of Fujitsu Ltd., Hitachi Ltd. and NEC Corp. All are faced with pricing pressure due to increased competition, a definitive split between high-end and low-end products and a less sophisticated user base demanding standardized software.

And while the supercomputer market is expected to grow 23.4% compounded annually, from $1.06 billion last year to $2.46 billion in 1992, according to Dataquest Inc., a market research firm in San Jose, most analysts agree that it's not large enough to accomodate the five suppliers currently in it. Early this year, Alliant Computer Systems Corp., one of two "mini" supercomputer makers, laid off almost 20% of its workforce to restore profitability in the face of cutthroat pricing.

American companies are poised to enter the fray. The computer division of Evans & Sutherland Computer Co., in Mountain View, Calif., will deliver its first supercomputer later this year. And Supercomputer Systems Inc., founded by former Cray designer Steve Chen and financially backed by IBM, will be unveiling a system in 1992.

Lock-out

Both Japanese and American suppliers also face a virtual lock-out in each other's markets. It is difficult at best for either Cray or ETA to sell into Japan and it's almost impossible for Fujitsu, Hitachi and NEC to sell into the U.S. Fujitsu has sold two sytems in the United States; NEC has leased, not sold, one sytem and Hitachi has yet to install in the U.S.

Admittedly, the roadblock into the U.S. has been set up by the U.S. government, which has encouraged supercomputer users to buy American. "There is a great deal of government concern that these very large Japanese companies could squeeze out small U.S. companies," says Christopher Willard, a senior industry analyst with Dataquest.

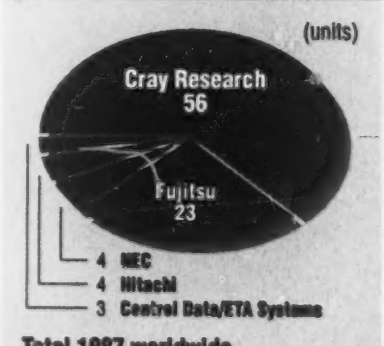
But Japanese companies have encountered other problems in the United States. "The Japanese have had a difficult time in the U.S. because their machines are too expensive," contends Willard. A single central processing unit from NEC, for example, says Willard, costs about $22 million, while a comparable configuration from Cray is priced at around $17 million. The Japanese companies have been quick to discount but can only go so far without annoying Uncle Sam.

Initially, Fujitsu and Hitachi offered compatibility to IBM's mainframe operating system in a marketing debacle uncharacteristic of Japanese companies. Scientific and technical users, the bread and butter supercomputer users, could not have cared less about IBM-compatibility.

Late last year, reports indicated that NEC might withdraw from the U.S. market altogether if its joint marketing venture with Honeywell Inc. didn't bear fruit after the Japanese company's next-generation machine is introduced early next year.

Samuel Adams, vice president for marketing operations at HNSX Inc., the joint venture in Burlington, Mass., says such a decision has not been made. But he does concede it is possibile if business doesn't pick up. "There's no business in the world that can survive five years without selling anything," he says.

Supercomputer shipments



Total 1987 worldwide shipments: 90

Source: Dataquest Inc.

They will return

But no one would count the Japanese companies out of the U.S. market. "They are now preparing Unix and a lot of software applications," says Jean-Yves LeClerc, president of Evans & Sutherland's computer division. "They will be back with strong price/performance in 1991."

ETA, the only other American supercomputer supplier shipping systems today, has suffered from some of the same problems as its Japanese counterparts. The company has been slow to move to Unix and its dependence on outside suppliers for some software technology has caused delays.

Now ETA is working to port as many application packages as possible to its system. "You have to have enough critical mass to attract vendors," says Stephen Lewis, ETA's general manager of industry marketing. In addition, new users are adamant about standards and ease of use. "Once the pioneers have been satisfied," says Lewis, "the next buyers will be more demanding."

While ETA has been successful with its low-end, air-cooled $1 million machine, the market has not responded as well to its high-end ETA 10 system. Last year, the company sold seven high-end systems. In the meantime, ETA has lost at least five accounts to Cray, concedes Lewis. But ETA is more concerned with its Japanese competitors. Lewis says that while today's largest market for supercomputers is virtually owned by U.S. suppliers, tomorrow's largest market — the Far East — is owned by Fujitsu, Hitachi and NEC.

ANNE KNOWLES

Fiber-optic LAN makers search for new markets

Fiber-optic networks are considered expensive for desktop applications. But vendors are optimistically seeking niches and standardizing products

BY DWIGHT B. DAVIS

Fiber-optic communications technology has begun to shine in metropolitan and long-distance telephone applications, but its success to date in the local-area networking data-communications market has been less than sparkling. Some LAN vendors now hope to change that picture by better targeting niche applications suited to the light-transmitting medium, and by uniting behind a nearly complete interconnection standard: the Fiber Distributed Data Interface (FDDI).

From 1987 to 1988, fiber-optic LAN revenue was expected to grow 58.3%, from $70 million to $111 million, according to projections made by Dataquest Inc. last June. Still, that $111 million would represent just 4.3% of the total U.S. LAN market, which was expected to reach $2.58 billion last year.

The market for fiber-optic LANs can be broadly divided into low- and high-end camps, says Kim Myhre, vice president for research and consulting at the Business Research Group, a Cahners Publishing Co. subsidiary. The low end consists of Ethernet-type and token-ring LANs running over fiber at speeds of 10 megabits per second (Mbps) or below; the high end encompasses several proprietary networks with 50-Mbps or greater bandwidths and the 100-Mbps FDDI emerging standard.

By definition, the low-end LANs don't take advantage of fiber's most apparent strength — its high-speed bandwidth potential. Instead, the lower speed LANs highlight other fiber-optic characteristics, including the medium's immunity to electromagnetic interference, its resistance to unauthorized tapping, its ability to operate over long distances (by LAN standards), and its compactness relative to coaxial cable.

Premium price

These selling points are important at the low end because the cost of fiber-optic LANs continues to exceed that of networks based on coaxial or twisted pair media. For example, 10NET Communications, a division of Digital Communications Associates Inc., offers a 10-Mbps fiber-optic LAN in which each connection costs $1,295 per node. The firm's coaxial Ethernet connections, on the other hand, sell for $695 each.

Given this cost differential, 10NET is focusing on the security advantages of fiber optics, notably its lack of electromagnetic emissions that could be surreptitiously intercepted. This characteristic is especially important in many military and government applications, which together constitute "a huge marketplace," according to 10NET president Greg Goodall.

10NET has installed "tens of thousands" of 1-Mbps fiber-optic LAN nodes, mostly in government applications, according to Goodall. This lower speed 10NET LAN is available in a version that meets Department of Defense Tempest security requirements, and is currently installed in agencies such as the Air Force Electronic Security Command and the Federal Bureau of Investigation.

The newer 10-Mbps 10NET LAN will also be offered in a Tempest version. In addition, to further enhance the inherent security aspects of the fiber medium, the company is developing the 10NET Secure LAN, which will add data encryption to the basic LAN capabilities.

"We expect the secure local area network develop-

Jugtar S. Basi, VP at Artel Communications: "It's a joke for companies to say that they have FDDI available today"

Dave Bradley

ment effort to yield tremendous rewards as federal agencies and the banking community begin to realize the significance of true data security and integrity," Goodall says. The banking and financial marketplace for fiber LANs is just beginning to develop, but has great long-term potential, according to Goodall.

On the factory floor

Aside from secure applications, fiber-optic LANs were expected to proliferate in factory environments where electromagnetic noise from machinery can sometimes interfere with electrical LAN signals. Some manufacturing plants have installed such LANs — Proteon Inc. of Westborough, Mass., for example, has placed fiber-optic versions of its ProNET-10 LAN in factories since 1983 — but the market hasn't developed as rapidly as some anticipated.

Part of the problem can be traced to the dominance of the coaxial-based MAP protocol in factory settings, says analyst Myhre. In addition, he points out, Digital Equipment Corp. has always had a major presence in manufacturing plants, and has successfully promoted the use of the Ethernet coaxial network in such environments. Nevertheless, Myhre and others believe factories represent one of the niche markets where the strengths of fiber will sometimes outweigh its costs.

As for the typical office environment of networked personal computers, not even the most ardent purveyors of fiber-optic technology see much of a near-term opportunity. "There will be no great demand for running fiber to the desktop," says Howard Salwen, Proteon's founder. "The technology is still too expensive relative to plain wire."

All this adds up to a legitimate, but limited, marketplace for low-speed fiber-optic LANs. As one measure of its limits, Hal Spurney, director for marketing at Fibronics International Inc. in Hyannis, Mass., estimates only 5% to 10% of the popular Ethernet LANs are likely to ever convert to the fiber medium. As a result, many vendors are focusing their attention at the high end of the market, where the FDDI standard is just beginning to take hold.

Under development for several years, the FDDI is broken into four standards that define basic physical, logical and data management criteria for establishing a 100-Mbps fiber-optic network. Three of these four standards — two that encompass the physical connection specifications and one that defines a token-passing protocol for the network data — have been ratified by the American National Standards Institute (ANSI).

The fourth standard — that of station management — handles such tasks as fault isolation and coordination of the other standards' operation, and is not yet formally established. The current unavailability of the fourth piece of the FDDI puzzle has resulted in various claims and counterclaims about products said to be FDDI compatible.

"It's really a joke for companies to say that they have FDDI available today," says Jugtar S. Basi, vice president for business development at Artel Communications Co. Basi concedes that "FDDI is not yet signed off." Spurney at Fibronics is more optimistic. He argues that FDDI-based products can be sold now, with the software-oriented station management standard added later.

In this regard, Spurney draws an analogy between the introduction of FDDI and the earlier debut of the Ethernet LAN. "People were shipping Ethernet products in 1980, even though the Ethernet standard [in the form of IEEE 802.3] wasn't formally established until 1985," he notes.

First chip set

Fueling the rush to FDDI is the availability of the first chip set to implement the existing portions of the standard. Advanced Micro Devices Inc. of Sunnyvale, Calif., has a five-device Supernet chip set which sells for $625 each in 100-unit quantities, and is expected to significantly reduce the price of FDDI-type interconnections.

A number of fiber-optic component and networking vendors intend to make use of the AMD chips. These include beta test sites Hewlett-Packard Co., which manufactures fiber-optic transceivers, and Proteon, which offers a proprietary 80-Mbps network that it says can be upgraded to FDDI.

AMD anticipates that FDDI-based products will account for $150 million in revenue in 1989, with the bulk of the products incorporating the Supernet chips. By year end, the price for a single FDDI connection should fall to the $7,500 to $10,000 range, predicts Bert Williams, strategic marketing manager for AMD's High End Networking Group.

To reach that level, prices will have to drop significantly. Fibronics is selling the first product based on the AMD chips — the FX8210 Ethernet-to-FDDI Learning Bridge — for $24,900. The device connects Ethernet/IEEE 802.3 networks to an FDDI fiber

Howard Salwen, Proteon's founder: "There will be no great demand for running fiber to the desktop"

Dave Bradley

"backbone" type of network.

Such backbone applications that link two or more lower speed LANs via a high-speed fiber network represent one of three potential FDDI markets, according to most industry participants. Along with the LAN-to-LAN backbone sector are the interconnection of clusters of mainframes and minicomputers and the linking of high-end workstations such as those from Sun Microsystems Inc. and Apollo Computer Inc.

The most likely promoters of FDDI for "back-end" computer clustering are the major CPU vendors themselves, such as IBM and Digital. "All the major computer manufacturers have endorsed FDDI, but none are yet offering products," notes Myhre.

How well FDDI will penetrate these back-end applications remains an open question, however. "Within the computer room, you can often use wire just as easily as fiber optics," says Salwen at Proteon. "We prefer a mixed media approach in which we use wire when we can in order to save money."

The LAN-to-LAN backbone marketplace is where most of the current FDDI development activity is concentrated. The relatively high costs of connections into FDDI networks can be more easily justified if each connection interfaces with an entire LAN.

Because Ethernet networks are the predominant LAN in the marketplace, most high-end fiber-optic vendors are concentrating on linking these types of networks via FDDI backbones. Such fiber connections are able to extend Ethernet networks — normally limited by their transmission/collision detection technology to intra-building installations — over several kilometers.

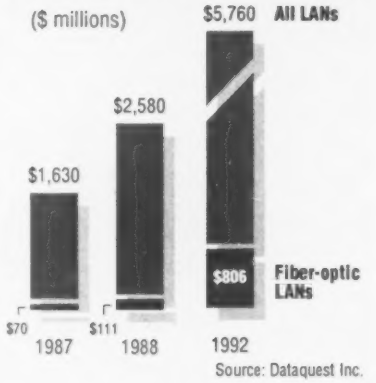
In the long run, the local networking of high-speed workstations could become the predominant FDDI marketplace, but not without a struggle. Connection costs will have to drop significantly before users can cost justify workstation-to-FDDI links, and some are doubtful of the prospects.

"FDDI will be far more expensive than people initially anticipated," believes Salwen. Even though the integrated AMD chips cut costs compared with a discrete component approach, other necessary high-cost devices such as optical transmitter and receiver pairs and circuitry to drive the 100-Mbps network operation will limit the potential price reductions, he says.

Salwen also says that the yet-to-be-defined system management portion of the FDDI standard will require its own dedicated CPU to operate efficiently. "You might use a 68002-level board to run the system management, but such a board lists for about $2,500," he notes.

Even if single connection prices fall to the $7,500 to $10,000 range that AMD's Williams expects by year-end, few workstation installations could afford them, Salwen believes. He says users would prefer to spend about 10% of the cost of a workstation on a communications peripheral, although they might be willing to pay as much as 25% for such a device. "If workstations cost from $15,000 to $20,000, the LAN connections should cost about $3,000 to $4,000," he says. "It's tough to see how we will get to that level with FDDI."

U.S. LAN market



Source: Dataquest Inc.

Split opinion

Even if the cost issue is surmounted, FDDI faces another potential barrier to its widespread implementation. This barrier has as much to do with politics as with technology, and has resulted from a split in opinion about what features a high-speed fiber-optic network should provide.

The FDDI standards development effort broke into two camps early on, according to Artel's Basi. One group, known as FDDI I, was very data oriented and eventually prevailed in establishing its criteria as the current FDDI standard, he explains. The second group, FDDI II, was more interested in offering multiple services, such as voice and video, as well as data over fiber. Basi says many people from this group have since moved to back an emerging IEEE fiber-optic standard — 802.6 — that offers such mixed service at 100-Mbps and 150-Mbps transmission rates.

Not surprisingly, according to Basi, most computer vendors back the data-oriented FDDI standards, while the IEEE 802.6 effort has gained the support of the regional Bell Operating Companies and other telecommunications-based vendors. Basi says it is unclear to what degree the two standards might compete.

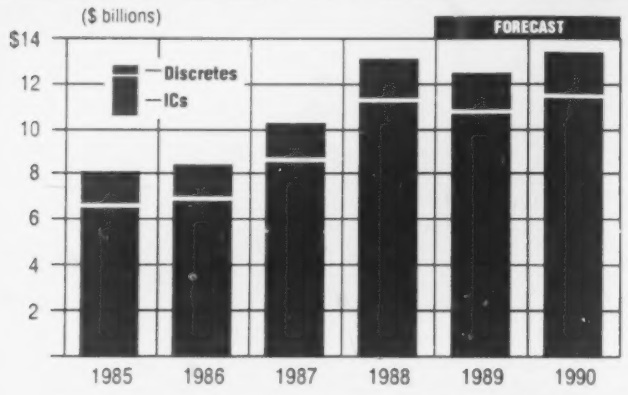
For its part, Artel has positioned its 100-Mbps FiberWay optical network products to conform to the mixed-service approach embodied in the IEEE 802.6 development, although Basi says the company will also offer FDDI once it is fully defined. "We could put 802.6 over our FiberWay networks today without pulling out any equipment," he says, "if there was an 802.6 bridge product available."

Most other fiber-optic networking vendors acknowledge that the FDDI and 802.6 standards could compete in some areas. But they argue that, for LAN applications such as back-end computer links, backbone LAN connections and workstation networking, the data-oriented FDDI approach makes the most sense.

Given the remaining uncertainty about the details of high-speed fiber-optic networking, some users are positioning themselves to take advantage of any future developments. "Since the biggest cost of networking is running the cable, companies are attempting to put in a cable plant that will last for 20 years," says Graeme Plant, marketing product manager at Hewlett-Packard's Roseville Networks Group.

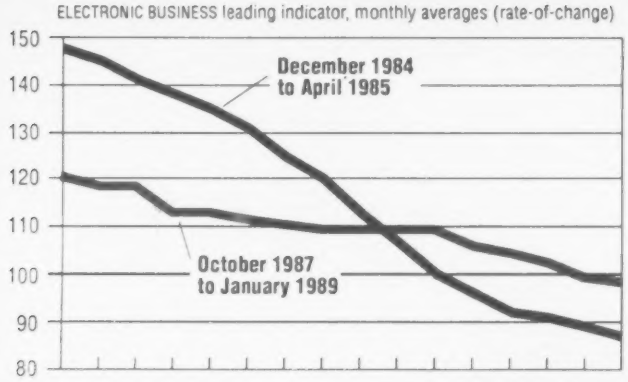
For LAN vendors, the safest and most successful approach is to offer products that can run on either electrical wire or on fiber-optic cable, says Proteon's Salwen. "The fiber nodes may represent only a small proportion of the total number of LAN nodes installed," he says, "but you may still need fiber in your bag of tricks to make the sale." □

U.S. semiconductor sales outlook



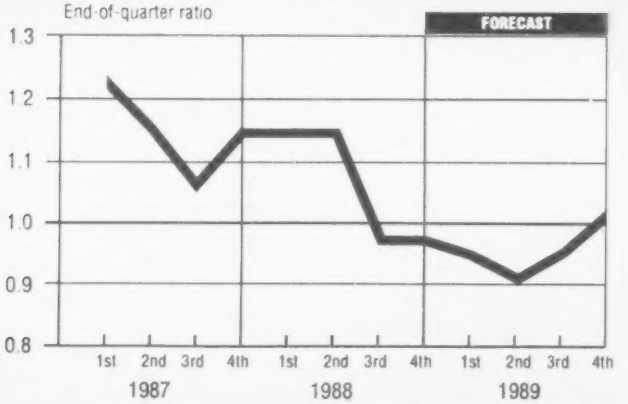
Historical data: Semiconductor Industry Association; Forecast: Cahners Economics

Two semiconductor downturns



Historical data: ELECTRONIC BUSINESS

U.S. semiconductor book-to-bill ratio



Historical data: Semiconductor Industry Association; Forecast: Cahners Economics

Why the semi industry won't crash again

Everybody's speculating about a crash in the U.S. semiconductor industry. Industry leaders are gun-shy and, after the experiences of 1985, understandably so. But evidence is mounting that no crash is in the offing.

Cahners Economics' forecast for semiconductor sales continues to call for a 5% drop in 1989 and a 7% gain in 1990. The slight decline expected this year could be a bit deeper if prices fall further than expected. If prices stabilize, that decline could disappear as well. The key to the outlook: Price changes will determine the eventual outcome of dollar sales this year. Unit sales of semiconductors won't grow much, but they won't fall far either.

All signs point to moderation

The foundation for this forecast rests on several facts. First, look at the ELECTRONIC BUSINESS leading indicator. Back in January 1984, the ELECTRONIC BUSINESS indicator peaked at 147 and fell 41% over the next 15 months.

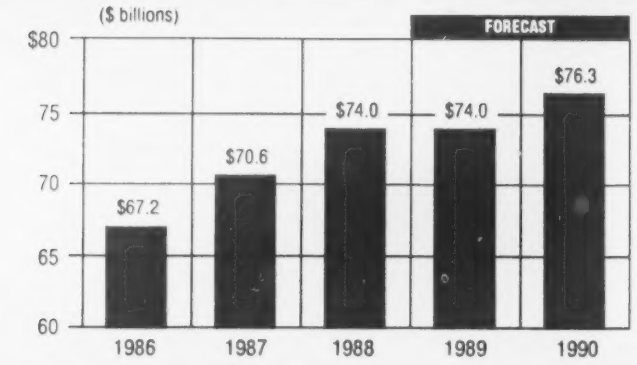
This time around, the ELECTRONIC BUSINESS leading indicator peaked at 120 in October 1987. In the 15 months since hitting that high, the ELECTRONIC BUSINESS indicator has fallen 19% — only half as much as the 1984-1985 slide. If the ELECTRONIC BUSINESS leading indicator maintains its predictive power, it clearly says semiconductor sales growth will fall, but not as far down as in 1985.

One of the critical elements of the ELECTRONIC BUSINESS leading indicator is the inventory of electronic components. With 20/20 hindsight, we know that a severe inventory cycle pushed the semiconductor industry down four years ago. Now, by all accounts, inventories have been managed much more efficiently. The result means no serious inventory overhang and no crashing halt to semiconductor production.

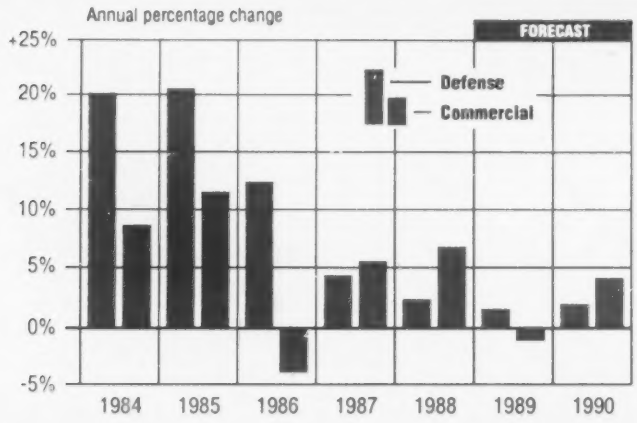
Everything about the nature of the 1988 upswing in semiconductor sales points to moderation in any downturn in 1989. Delivery times for components — even memories — were shorter in 1988 compared with 1984. The value of the U.S. dollar was low, prompting vigorous export growth. All in all, it was a more sane, more manageable economic environment for semiconductor makers in 1988, and the same can be expected in 1989.

ELIZABETH B. BAATZ

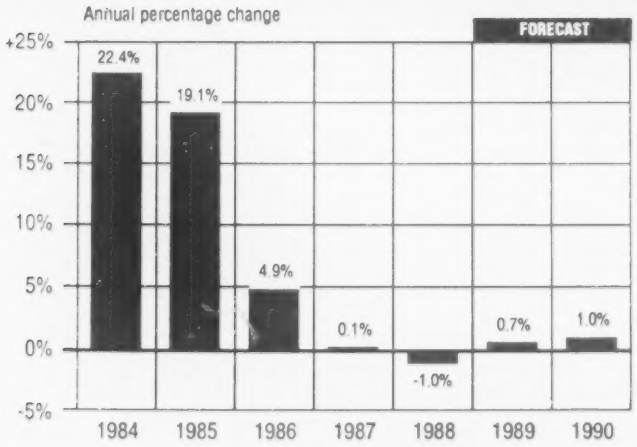
Communication equipment shipments



Defense versus commercial shipments



Communication equipment backlogs



Historical data: U.S. Commerce Department; Forecast: Cahners Economics

Going gets tougher in communications

New orders for communication equipment had a flurry of activity in November, rising 26.2% from October to reach $7.67 billion. A large defense order produced this one-month jump as it did back in April of 1987, when total new orders surged to $7.18 billion from only $4.47 billion the month before.

Because of defense procurement, monthly new orders for communication equipment can be erratic. However, the longer term trend is clear. Growth in new orders peaked back in the first quarter of 1988 and has been shrinking ever since. Most of the contraction is in orders for military equipment, but growth in new orders in the commercial sector has also now passed through its peak phase. Don't look for more than a 1% increase in new orders for nondefense communication equipment this year.

Shipments of communication equipment dropped a meager 0.7% from October to November, to $6.07 billion. That's just 1.7% ahead of billings back in November 1987. After growing 12% in 1986 and 4% in 1987, shipments of defense communication equipment increased only about 2% to 3% in 1988 and are expected to inch up just 2% this year. Sales of commercial communication equipment climbed a stronger 6% to 7% last year, but are forecast to actually fall 1% in 1989.

Headed for a difficult year

Business investment in equipment is forecast to increase just 1% to 2% from 1988 as buyers react to increased interest rates and a slowdown in demand for their products. In the third quarter of 1988, business purchases of communication equipment reached an annualized $36.4 billion (constant 1982 dollars), or roughly 2% above the same quarter in 1987. However, the growth rate was down from the 7% hikes in both the first and second quarters of last year.

Furthermore, the communication equipment industry is plagued by relatively low backlogs. At the end of 1986, unfilled orders totaled $67.2 billion. Backlogs were flat in 1987, but in 1988, unfilled orders dropped about 1%. Not surprisingly, the stagnant growth in backlogs is largely the result of shrinkage in the military sector.

MADELINE FRANCHI